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## **Mental Health and Labor Markets Productivity Loss and Restoration**

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## Introduction

Work is a fundamental human activity. An individual's job and attachment to the labor force contributes to his or her economic well-being, identity and social status. For society at large, the stock of human capital is linked to economic growth and financial demands that are placed on governments that provide social insurance to their citizenry. An individual's ability to work and the level of productivity on the job are reflections of an individual's functional status. The degree to which disease interferes with labor market activity and individual productivity constitutes an important component of the burden of illness. In fact, it can be shown that the impact of illness on labor markets provides a lower bound estimate of the indirect social cost of illness<sup>1</sup>, or the costs that are incurred as a consequence of having a disease. The extent to which prevention and treatment of illness diminishes the impact of disease on labor market outcomes serves as a tangible measure of the value of health care.

Mental and addictive disorders constitute a prevalent and disabling class of illnesses<sup>2</sup> that impose a large burden of disease globally.<sup>3</sup> Yet policy makers and the general public have been slow to recognize the social costs imposed by mental and addictive disorders and in turn have assigned less urgency to promoting treatment of these disorders than many students of mental illness believe is socially desirable.<sup>4</sup> This reluctance to attend to the problems created by mental and addictive illnesses is in part due to the stigma associated with these conditions. There is also skepticism regarding the effectiveness of many treatments for mental and addictive disorders and the degree to which spending on mental health and substance abuse (MH/SA) treatment constitutes a productive investment of scarce treatment resources. For these reasons, documenting the disabling impacts of mental and addictive disorders and examining evidence on

the effect of treatment on the labor market burdens of mental and addictive illnesses provides a foundation for evidenced based policy.

Mental and addictive disorders are often chronic and recurring illnesses. Frequently, initial onset occurs during the latter part of adolescence and young adulthood. This means that these disorders strike during years when people typically invest in human capital such as schooling and training. They are also prevalent during peak earning years, unlike many other disabling conditions that occur later in life. As such, mental disorders are especially disruptive of careers and productivity. The disabling effects of mental illness can render individuals reliant on social insurance programs for support for an extended time thereby placing heavy economic burdens on these programs.<sup>5</sup>

In this paper, we review evidence on the links between MH/SA disorders and labor markets. We step beyond the most prevalent research on documenting the social cost of mental and addictive disorders in order to address the potential improvement in social welfare that could result from expanding treatment for these illnesses. The paper is organized into four sections. Following this introduction, the second section explores a number of conceptual or theoretical issues that are necessary for linking MH/SA disorders to labor market outcomes. The third section of the paper examines evidence on the social costs for specific disorders and in the aggregate, as well as the impact of treatment on work activity and the degree to which these results vary for different nations. The fourth and final section draws some conclusions from extant evidence and offers suggestions for prioritizing research in this area.

## **II. Theoretical Considerations**

The economic analysis of the impact of health status on labor market outcomes has its intellectual origins in the work of Gary Becker and Michael Grossman.<sup>6</sup> In the Becker-Grossman

formulation, households are assumed to pursue the objectives of maximizing the subjective benefits stemming from health status, consumption of goods and leisure time. Households pursue this objective constrained by a health production function, income, assets and available time. The health production function summarizes the relationship between inputs into health (and in this case mental health) and health. That is, treatment resources and environmental factors existing in the community that affect mental health. Key inputs include visits to health and mental health care professionals, prescription drugs, the time spent by friends and family members offering support and reassurance and environmental conditions such as stress, and safety.

Health in this model is valued for its own sake and because it contributes to the availability of productive work time and healthy leisure time, thereby raising income and increasing the enjoyment of leisure. This formulation represents a point of departure for empirical investigations of the impact of health, and in our case mental health, on work effort, earnings, wages and poverty. The model predicts that ill health stemming from a mental disorder would tend to reduce earnings (through lower productivity), labor market supply and labor force participation at prevalent market wages<sup>1</sup>. The resulting estimate of the labor market consequences of ill health is a key component of so-called cost of illness studies.<sup>7</sup>

The Becker-Grossman model also implies that investing in effective treatments can address the impairments stemming from illness and in turn restore an individual's ability to engage in productive activity. While both intuition and formal theory yield expectations that mental illness would result in unfavorable labor market outcomes, obtaining clear empirical results on these questions has often been difficult. Likewise, examining the labor market impacts of expanding treatment is a complicated methodological undertaking. Methodological

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<sup>1</sup> This model focuses on the supply side. Demand is assumed fixed and employers are willing to pay workers the value of the marginal product. Stigma may affect demand but is not tested in this model.

challenges include measurement of mental illness and establishment of causal links between illness, treatment and labor outcomes.

Cost of illness studies are frequently presented as an estimate of the potential gains from expanding treatment for a particular illness or set of illnesses. The recent *Mental Health: A Report of the Surgeon General* made that connection clearly. The report stated:

“In the United States, mental disorders collectively account for more than 15 percent of the overall burden of disease from all causes and slightly more than the burden of cancer (Murray and Lopez, 1996). The data underscore the importance and urgency of treating and preventing mental disorders and of promoting mental health in our society”<sup>2</sup>.

The implication is that by taking aggressive action to prevent and treat mental disorders the large disease burden can be reduced. That conclusion relies on a complicated set of causal relations that tie the imposition of social costs, treatment and impacts on labor market outcomes together. Specifically, to conclude that expanding mental health treatment will realize gains that are reflected by the productivity losses estimated in cost of illness studies requires establishing that the following relationships hold: 1) Individuals that generate the social costs (e.g. those that experience diminished productivity because of mental illness) get treated. 2) That treatment delivered in actual clinical settings is effective in improving clinical outcomes. 3) That the improvement in clinical outcomes results in improved work place functioning. 4) That the treatments restore work place functioning to approximately the level of people who have never been sick. In discussing the evidence below we will consider extant evidence in the context of these causal linkages.

#### *Becker-Grossman and the Cost of Mental Illness*

Two important issues for cost of illness analyses arise from the Becker-Grossman framework. (1) that labor supply and mental illness are jointly determined which complicates empirical analyses of the productivity costs of mental illness. (2) Cost of illness estimates are

made conditional of a particular set of labor market institutions. Thus, the cost of illness will tend to vary substantially across populations, regions and nations. One implication of using the Becker-Grossman model to study the productivity impacts of mental disorders is that employment, income, treatment and health are determined simultaneously. In particular, it has been posited that the characteristics of particular occupations and work environments contribute to stress and possible emergence of mental disorders.<sup>8</sup> For this reason, indicators of mental health or mental illness may be correlated with the error terms in regression models, thereby resulting in inconsistent estimates of the impact of mental illness on labor market outcomes. Similarly, if the people with the most severe impairments are also those who require the most intensive treatment, there will be a tendency to observe a negative correlation between treatment and mental health status<sup>2</sup>. In addition, if the most impaired people are also those that have the weakest attachment to the labor market, then there will also be a negative correlation between treatment and labor market outcomes.

Researchers have adopted one of three approaches to dealing with causal links between mental illnesses and labor market outcomes. One approach is to simply assume mental health to be exogenous to labor market outcomes. A second approach recognizes the possible two-way causality between mental health and work and uses temporal ordering of events to sort out causality. Such an approach measures mental health status prior to the measurement of work and earnings (by 3 or 6 months). This may reduce the influence of reverse causality, but because mental disorders are often persistent illnesses this approach may not remove all such effects. The third approach uses structural equation methods, such as two-stage least squares, to account for observable and unobservable effects on mental health and labor outcomes. The key challenge

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<sup>2</sup> It may also be true, in some cases, that the most motivated people will be those that get treatment and in turn get better (a positive correlation between illness and care). The empirical evidence suggests that the negative correlation is dominant.

here is meeting identification conditions via exclusion restrictions. Recent developments in the analysis of mental health on earnings, labor supply, and wages have made use of the clinical features of disorders, such as heredity, to identify the models and establish causal links.<sup>9</sup>

A second implication of the household production framework for interpretation of cost of illness studies is that the cost of illness estimates represent a labor market equilibrium outcome for a given set of labor market structures, including regulation and the design of social insurance. These structural features of labor markets may exert important influences on labor market behavior. To illustrate this consider the following. Assume that mental disorders affect the formation of human capital as measured by educational attainment. Assume further that the presence of social disability insurance reduces the employment levels for low wage, low education workers. Studies that estimate the impact of mental disorders on employment and earnings will tend to overestimate the impact of mental disorders on employment by attributing a social insurance effect to the presence of a mental illness unless the design of social insurance is explicitly taken into account.<sup>10</sup>

Measurement of mental illness in cost of illness studies also poses a methodological and practical challenge. In research on mental illness and work, studies have adopted one of several strategies to measuring mental illness. One approach is to ask individuals if they have ever been treated for a mental disorder and if so, what disorder did their physician identify them as having. Frank and Gertler identify this as a utilization-based approach.<sup>11</sup> A second approach has been to ask people about their mental health status allowing them to characterize it as excellent, good, fair or poor. The third and most recent method involves using questionnaires that elicit clinical symptoms and either use those symptoms as direct indicators of mental distress or apply clinical algorithms to arrive at diagnoses.<sup>12</sup>

Empirical studies using the various measurement approaches obtain substantially different estimates of the impact of mental health problems on labor market outcomes. For example, Frank and Gertler tested a utilization based mental illness indicator against one based on a population interview that created diagnoses based on symptoms. They found that the presence of a major mental disorder as measured by symptoms from an interview reduced earnings by 21% whereas the utilization based indicator was associated with a roughly 5% reduction in earnings. Mullahy and Sindelar used self-reported mental health status as one indicator of mental health status and found some evidence of higher employment rates among rates among people with higher mental health status.<sup>13</sup> In general, there is reason to prefer symptom-based indicators based on clinical interviews. Utilization-based indicators tend to measure both the likelihood that someone with an illness gets treated and the nature of the illness for which they receive care. Because utilization is related to income, education, and age, there is likely to be a confounding between illness and labor market outcomes. In the case of self-reported health status there is a concern with bias in reporting. That is, people with lower labor market attachments appear to be more likely to report ill health as the reason for low work activity.<sup>14</sup>

Empirical analysis of differences between self reported assessments of mental health status and diagnoses based on clinical interviews reinforce concerns with self- report measures. Savoca analyzed differences between the two approaches to measuring mental health.<sup>15</sup> Compared with the measures from clinical interviews self reported mental health has a steeper gradient with education. White men tend to rate their mental health better than other gender and ethnic groups even when controlling for counts of symptoms from clinical interviews. The implication is that impact estimates from models that include demographic covariates when

mental health is measured by the excellent, good, fair, poor indicators will produce inconsistent estimates. The field has, therefore, begun to focus efforts on community surveys that elicit symptoms of mental disorders.

In the area of substance abuse measurement of what constitutes abuse or disorder has plagued cost of illness studies. In some studies of the impact of drug abuse on labor market outcomes, reports of any use of illegal drugs were treated as a disorder.<sup>16</sup> Other studies have attempted to use clinical diagnostic criteria to define disorders.<sup>17</sup> A third class of analyses uses levels of use that may be linked to impairment to define abuse.<sup>18</sup> As we will show below, there are substantial differences in the results obtained from the use of these different definitions of abuse.

*Becker-Grossman: Linking Treatment to Improved Productivity*

With respect to the relationship between treatment and labor market outcomes, two general approaches are available for untangling the causal links between treatment and outcomes. They are the randomized clinical evaluation and the structural equations approach. Each has a set of strengths and limitations. One body of literature is based on including labor market outcomes as part of either a randomized efficacy or effectiveness trial (Mintz et al, 1992, Wells et al, 2000). For that class of analysis, causal inferences regarding the impact of a specific treatment on labor market outcomes are at their strongest. The design of a controlled trial allows for estimation of causal relations that are free from selection bias and two-way causal paths<sup>3</sup>.

Unfortunately, that source of evidence offers only limited insight into a key question, noted above, that is of central importance for public policy: What is the impact on labor market outcomes of expanding the types of treatment that people actually receive in every day mental health or substance abuse treatment settings? Since clinical trials are applied to precisely defined

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<sup>3</sup> Non random attrition and cross over effects can weaken the inferences from these study designs.

populations where the delivery of care is carefully controlled to adhere to a specific treatment protocol, the results of a clinical trial are neither necessary nor sufficient as an estimate to answer the question regarding the introduction of a new treatment or the expansion of an existing treatment.<sup>19</sup> This is because when treatments are introduced into practice they are applied to a variety of populations, only some of which closely resemble those studied in the clinical trials. In addition, providers tend to modify the delivery of care to suit their practices and their own preferences. Thus, when treatments are introduced into practice there is little guarantee that the treatment will be applied to the populations and according to the protocol under which they were tested in the laboratory (clinical trial). Both of these types of “allocation effects” will serve to drive a wedge between clinical trials results and the outcomes obtained in every day clinical practice.

The second approach to estimating treatment impacts on labor market outcomes for people with mental disorders relies on applying causal models to observational or quasi experimental data on people suffering from mental disorders. As in the discussion of causal linkages in estimating the impacts of mental disorders on labor market outcomes, the key to estimating a causal linkage is the identification of factors that affect entry into various types of treatment that are not directly linked to outcome. This is important because it has commonly been observed that individuals using mental health services most intensively are often those people who are the sickest. In observational data, this will tend to produce a correlation showing that more treatment is associated with poorer outcomes. The observed correlation is a reflection of the selection process into treatment and not a causal impact of treatment on health or labor market outcomes. There are few studies that have taken this approach.<sup>20</sup>

### III. Evidence

Results from recent aggregate estimates of the social costs of mental illness and substance abuse in the U.S. are reported on Table 1 to provide a context for examining extant evidence on microeconomic analyses of the productivity impacts of mental illness and substance abuse disorders. These estimates will also frame the review of evidence on the links between expanded treatment and reduced social costs of illness. Table 1 breaks down estimates by major class of disorder, including anxiety, schizophrenia, affective, alcohol and drug abuse illnesses. The table reveals that alcohol abuse; drug abuse and anxiety disorders impose the largest productivity costs on the U.S. Alcohol abuse accounted for \$119 billion in lost productivity in 1995, drug abuse for \$77 billion and anxiety disorders for \$49.6 billion in 1994. Affective disorders (depression) that have received the most focused attention in terms of their impacts on the work place were estimated to generate productivity losses of nearly \$14 billion in 1994. Finally, schizophrenia was associated with about \$17 billion in lost productivity in 1994.<sup>21</sup>

Table 1: 1994 Estimates of Productivity Loss Due to Illness						
	<b>Anxiety</b>	<b>Schizophrenia</b>	<b>Affective</b>	<b>Other</b>	<b>Alcohol</b>	<b>Drugs</b>
<b>Morbidity</b>	47.8	15.0	3.1	22.4		
<b>Mortality</b>	1.8	1.8	10.7	2.2		
<b>Total</b>	<b>49.6</b>	<b>16.8</b>	<b>13.8</b>	<b>25.6</b>	<b>119.3</b>	<b>77.5</b>

#### *Labor Market Impact of Mental Illness: Industrialized Nations*

There has been an active research program in health economics on the labor market impacts of mental disorders. This line of research has typically focused on the effect of mental health problems on labor supply (hours and employment), earnings, and wages. A few analyses have also examined effects of mental health problems on job choice and the level of effort, holding constant hours of work and employment. In this section, we direct our attention to studies that measure mental health or mental illness by using data from clinical interviews that

elicit symptoms and/or diagnoses. We also emphasize studies that attend to the causal issues either via use of panel data or by estimation of structural equation models.

Among the first studies conducted were those by Bartel and Taubman.<sup>22</sup> They used the National Academy of Sciences (NAS)-National Research Council (NRC) twins data. This is a longitudinal study of white-male twins that served in the U.S. armed forces. Mental health was measured by combining self-reports of illness and Veterans Administration medical records. Bartel and Taubman used the timing of illnesses and labor market outcomes to enhance causal inferences. They used ordinary least squares to estimate their wage models and a Tobit estimator for earnings equations. They reported wage reductions of about 8% that were attributable to mental disorders. Earnings reductions of nearly 25% were estimated for individuals experiencing mental disorders. Moreover, depending on the specific mental illness, the impacts were found to persist for up to 15 years. Specifically, psychoses and neuroses (which at that time could include depression) were estimated to have effects on earning that lasted for 11 to 15 years. Finally, employment levels were estimated to be 6.8% lower for individuals who suffered from mental disorders.

Robins and Regier used data from the Epidemiological Catchments Area (ECA) study, sponsored by U.S. National Institute of Mental Health (NIMH), to examine the number of people reporting an inability to carry-on their usual activities due to a mental or emotional problem.<sup>23</sup> They estimated that 3% of men and 4.5% of women were unable to work or engage in regular activities because of a mental or emotional problem.

Mitchell and Anderson also examined data from the ECA.<sup>24</sup> They analyzed a sample of people aged 50 and above from 3 study sites (Baltimore, Durham and Los Angeles). Mental health was measured via an index of symptoms of depression and alcohol abuse obtained from a

structured clinical interview. They estimated employment models that treated mental health status as exogenous. They controlled for health status, demographics and market wages. Their results indicate that for older males higher levels of symptoms increase the likelihood of withdrawal from the labor market. The impacts for women were smaller and less precisely estimated.

Frank and Gertler used data from the ECA survey's Baltimore site to estimate the impact on male earnings of mental illness.<sup>25</sup> The mental illness indicator used a combination of diagnoses from a clinical interview and symptoms. Causal inferences were strengthened by using diagnostic information for a period prior to the measurement of labor market outcomes. The analyses used Tobit estimators and found that males with a mental disorder had earnings that were 21% lower than for otherwise similar males.

Ruhm made use of a survey of women's health in Massachusetts to study the impact of mental health on female labor supply.<sup>26</sup> 2,500 women aged 45 to 55 were surveyed in 1981-82. Ruhm used the CES-D depression scale that counts and assesses the intensity of symptoms of depression. He treated symptoms of depression as exogenous in the labor supply models estimated. Probit and ordered probit models were estimated. His results indicate that levels of symptoms that are consistent with a high likelihood of a diagnosis of depression reduced labor supply. For example labor force participation rates were 2 to 9 percentage points lower for women with high symptom counts compared to similar low symptom count women. The probability of being employed full time was 9 to 12 percentage points lower for women with high symptom counts compared to otherwise similar women.

Ettner, Frank and Kessler used the National Comorbidity Survey (NCS) to study the impact of psychiatric disorders on wages, hours of work and earnings for males and females. The

NCS yielded a nationally representative sample of 2225 males and 2401 women collected between September 1990 and February 1992. A structured clinical interview was administered to the entire sample that allowed for psychiatric diagnoses to be determined. Mental health was treated as endogenous. Instruments used to identify the mental health equation included parental history of mental disorders and onset of illnesses in early adolescence. Using a structural shift specification for the endogenous mental health indicator, Ettner et al estimated that the presence of mental illness led to reduced earnings of 9.5% for men and 29% for women. Mental disorders were estimated to reduce hours worked per week by 5.4% for men and 2.7% for women. Mental disorders reduced employment levels by 14 percentage point for women (83.6 to 69.4) and by 12.6 percentage points (93.9 to 81.3) for men. Thus the combination of lower employment and wage level attributable to mental illnesses is what drives down the income of women.

Marcotte, Wilcox-Gök and Redmond also used the NCS data to examine the effects of affective disorders on employment and income.<sup>27</sup> They measured mental disorders based on the results of structured clinical interviews and included a dummy variable when a subject was found to meet clinical criteria for each of the following three disorders: depression, dysthymia and bipolar disorder. Their results showed sizable and significant negative impacts of depression on employment and earning for women. The results for men were smaller and less significant.

Kessler and Frank examined employment effects and reduced effort stemming from mental illnesses across occupations.<sup>28</sup> This study also used data from the NCS. Mental disorders were measured in terms of major diagnostic categories constructed from a structured clinical interview. The analyses showed that employment effects, stemming from the presence of a mental illness, were similar across occupations. However, reduced effort or “cut back” days were greater for people with mental disorders in professional occupations.

Hamilton, Merrigan and Dufresne use data from a community survey of about 1800 people in east Montreal to study the relationship between employment and mental illness.<sup>29</sup> The authors use simultaneous equations methods to estimate models of employment and mental health status. Mental health status is measured using the Psychiatric Symptoms Index a 29-item questionnaire that identifies high levels of symptoms. They use a history of mental health problems and the number of non-employment stressful events to identify the mental health equation and family structure to identify the employment equation. The results show that unemployment has a significant negative impact on symptoms of mental illness (increasing the number) and poor mental health has a negative effect on the likelihood of being employed. The use of maximum likelihood estimation methods yields parameter estimates that are not interpretable in natural units (probabilities of employment).

Slade and Albers examined data from a long-term follow up study of people first studied as part of the Baltimore site of the ECA study.<sup>30</sup> Their analysis focused on rates of exit from the labor force. Using symptom clusters as their indicators of mental health problems they found a 65% increase in the hazard in labor market exit associated with depressive symptoms relative to otherwise similar people.

Alexandre and French studied the impacts of depression and depression with co-morbid substance abuse in a low-income population in Miami, Florida.<sup>31</sup> Using a sample of 1,274 adults they used the Zung Self-Rating Depression Scale (SDS) to identify people with depression and the Michigan Alcohol Screening Test (MAST) ten-item version to identify problem drinkers. Using structural equations methods they estimated models of employment and labor supply. They show that the presence of depression reduces employment by 19 percentage points from

43% to 24%. Depressed workers were also found to work 7 to 8 fewer weeks per year than otherwise similar workers without depression.

Slade and Salkever use the Schizophrenia Care and Assessment Program database of 1643 adults with schizophrenia to study the relationship between symptoms and employment outcomes in a population of people with schizophrenia.<sup>32</sup> This work looks at variation in labor market outcomes within a population that has a severe and persistent mental disorder. It therefore aims to provide estimates of the link between reduced symptoms and employment. The research uses a structural model to study the relative likelihood of competitive employment, sheltered or supported employment and no employment. They make use of detailed assessment of symptoms based on the Positive and Negative Syndrome Scale (PANSS), the Montgomery-Asberg Depression Rating Scale (MADRS), and the Simpson-Angus (SA) scale of extrapyramidal side effects from psychotropic drugs. The results from estimation of the structural model indicate that the presence of negative symptoms of schizophrenia (deficit in speech, flat affect, and attention impairments) significantly reduce the likelihood of obtaining employment. Symptoms of depression all reduce the likelihood of being employed but not as much as the negative symptoms of schizophrenia. Finally, the authors use the model estimates to show that in a population of adults with schizophrenia only 1/3 would work even if they experienced large reductions in symptoms of schizophrenia and depression.

The results reported by Slade and Salkever correspond well to a recent analysis of the National Health Interview Survey's disability supplement by Mechanic, Bilder and McAlpine.<sup>33</sup> In that study the authors report that 22% of people with schizophrenia worked in 1995 and only 12% worked full time.

### *Labor Market Impacts of Substance Abuse Disorders: Industrialized Nations*

The body of literature on the labor market impacts of substance abuse has also centered largely on differences in employment, hours and wages. Evidence of the impact of substance use and abuse has been mixed, with some studies reporting little effect on labor market outcomes or even a positive correlation between illicit drug and alcohol use and higher wages. This variation can in part be attributed to the problem of appropriately measuring substance abuse and distinguishing light drug or alcohol use from heavy or chronic use or dependence. Additionally, the direction of causality between substance use and labor market behavior is complicated and must be addressed in the design of the estimation approach. In this section, we focus on papers that, for the most part, account for these measurement issues.

Some of the earliest research to address the question of appropriate measurement of substance abuse was published in 1998. Zarkin, French, Mroz and Bray used data from the 1991 and 1992 National Household Surveys on Drug Abuse (NHSDA) to study alcohol use in male and female workers between the ages of 30 and 54.<sup>34</sup> They used self-reports of alcoholic drink consumption in the last 30 days to label individuals as non-drinkers or light, moderate or heavy drinkers. Zarkin et al employed ordinary least squares to estimate wage models. Their results indicate that the wages of men who are light, moderate or heavy alcohol users are 7% higher than the wages of male non-drinkers. A wage premium approximately half as large was reported for women but was not statistically different from zero.

Buchmueller and Zuvekas focused their research on drug use in men aged 18-45.<sup>35</sup> Using data from the Epidemiological Catchment Area (ECA) Survey from 1980-1984, they categorized individuals into three groups: nonusers/experimental users, non-problematic users (who had not developed drug dependence but had used drugs more than five times) and problematic users.

Buchmueller and Zuvekas reported a positive relationship between drug use and income for young workers aged 18-29, but lower incomes for those who use illicit drugs daily. A negative relationship between problematic drug use and income was found in men between the ages of 30 and 45. For both age groups, problematic drug use was negatively associated with employment, though these results are more pronounced for the 18-29 age group.

Claussen investigated the issue of causation of alcohol abuse disorders among unemployed individuals.<sup>36</sup> He used 5-year follow up data from a 1993 questionnaire given to Norwegian men and women aged 16-64 who were unemployed for at least 12 weeks prior to the initial 1988 survey. Problem drinkers were identified using the Alcohol Use Disorder Identification Test (AUDIT) and DSM-III diagnosis of alcohol disorders. Subjects who were re-employed in 1993 were less likely to score positive on the AUDIT, though none of the 7% of subjects who had a DSM diagnosis of an alcohol disorder in 1988 were employed in 1993. Claussen's work concludes that generally, unemployment causes alcohol abuse and that the inverse (alcohol abuse does not cause unemployment) is untrue.

Bray, Zarkin, Dennis and French used 1991, 1992 and 1993 NHSDA data on male and female workers to study the impact of substance use dependence on employment and hours of work.<sup>37</sup> Using DSM-III-R criteria for substance abuse, individuals were classified as nonusers or users with or without symptoms of dependence on heavy alcohol use, cigarettes, marijuana or other illicit drugs. Simple descriptive statistics and analysis of variance (ANOVA) models were used to show labor market outcomes. Bray et al estimated that men who had symptoms of dependence on illicit drugs other than marijuana were 22% less likely to be employed than nonusers. In addition, users with dependence symptoms had worked on average 9.5 fewer weeks in the past year and about 20 fewer hours in the past month than non-users. Substance use

dependence was also associated with lower employment rates for women, but not with fewer work hours.

MacDonald and Pudney investigated the relationship between “soft” (recreational) and “hard” (dependency) drug use and employment in young British men and women.<sup>38</sup> The authors noted that there is little national monitoring of drug use in the United Kingdom, though the British Crime Survey (BCS), a general study of crime and security topics in households, directs a few questions about drugs toward the interviewees. MacDonald and Pudney made use of the 1994 and 1996 BCS data to study current and past drug use and employment in men and women aged 16-25, the age group, they note, with the highest prevalence of drug use in Britain. The authors report a statistically significant association between past hard drug use and unemployment.

French, Roebuck and Alexandre examined employment and labor force participation effects of chronic and nonchronic drug use.<sup>39</sup> Data on men and women aged 25-59 from the 1997 National Household Survey on Drug Abuse was used to classify individuals as chronic and nonchronic drug users based on criteria from the Office of National Drug Control Policy. Chronic users were defined as individuals who had used one or more illicit drugs at least once per week in the last year, while non-chronic users had used any illicit drug within the last year. Probit models were estimated. The results indicate significant negative relationships between chronic drug use and labor force participation for men, and between chronic drug use and employment for both men and women. No significant association was found for nonchronic drug use in relation to employment or labor force participation.

Kenkel and Wang used the 1989 National Longitudinal Survey of Youth (NLSY) to study the consequences of DSM-III defined alcohol dependency as related to a variety of job

characteristics.<sup>40</sup> Their work, which focuses on men between the ages of 24 and 31, accounts for differences between “white-collar” and “blue-collar” employment, types of compensation and such fringe benefits as insurance, vacation time and sick leave. They found that wage loss due to alcoholism ranges from 4.6% to 9.8% and that alcoholics are less likely to receive fringe benefits and more likely to be injured on the job and work for smaller firms than non-alcoholics. Whereas white-collar alcoholics have the same earnings as their non-alcoholic peers, blue-collar alcoholics earn about 15% less than non-alcoholics. In addressing the issue of causality, Kenkel and Wang suggest that earlier heavy drinking may have consequences for future job outcomes.

As an extension of Kenkel and Wang’s research on male workers, Jones studied the relationship between drinking and job characteristics in women.<sup>41</sup> Using the 1989 NLSY, she classified women who had reported drinking in the last 30 days as alcohol abusers and dependents according to DSM-III-R criteria. In addition, Jones employed a “heavy drinking” measure that was used to identify individuals who had consumed 6 or more drinks in one day in the past month. Probit regressions were run. Heavy drinking was found to be negatively associated with wage and non-wage compensation, but no causal relationship was found between women’s drinking and job characteristics.

Barrett used the 1989-1990 Australian National Health Survey to examine the effect of alcohol use on the earnings of full-time male workers aged 25-59.<sup>42</sup> Subjects were identified as abstainers, moderate drinkers or heavy drinkers based on the number of drinks consumed in the month prior to the survey. Barrett used a multinomial logit choice model in his analysis and reported a significant earnings premium for moderate drinking as compared to abstention or heavy drinking. It should be noted, that “moderate” drinking encompassed a fairly wide range of

consumption, from one drink in the past month to no more than 7 drinks in one day during the past week. This again raises concerns about measurement in the key explanatory variable.

In order to further address measurement issues in determining alcohol dependence, Terza revisited a Mullahy and Sindelar paper on unemployment and problem drinking.<sup>43</sup> Using a different estimation method, Terza showed that problem drinking has a significant, negative effect on the likelihood of being employed. This association had previously been reported as insignificant.

### Who Generates Costs and Who Seeks Treatment: A Summary

Studies on the cost of illness and research on access to mental health care offer some insight into the characteristics of people who suffer productivity decrements because of mental disorders and of people who obtain treatment for mental disorders. Returning to Table 1 it is clear that mental and addictive disorders generate high levels of social costs. Table 1 makes it apparent that different disorders impose substantially different disease burden on society. Note for example, that among the mental disorders, anxiety disorders create the highest level of social costs followed by schizophrenia and depression. The addictive disorders also generate substantial productivity losses. Table 1 reports burdens of \$119 billion for alcohol abuse and \$77 billion for drug abuse. People with comorbid disorders typically suffer among the greatest productivity decrements. For example, anxiety disorder losses are so large because they create a great deal of productivity losses through their role as comorbid conditions.

Research also shows that the productivity losses vary by occupation and educational background of the affected individuals.<sup>44</sup> For example, data from the National Comorbidity Study suggests that professionals and people involved in sales have been shown to suffer the greatest productivity losses as measured by absenteeism and so-called cut back days.

Approximately 25% to 30% of people with a diagnosable mental disorder obtain treatment for those conditions. People with psychotic disorders have the highest rates of treatment (well over 50%). People with depression and anxiety disorders have considerably lower rates of treatment (closer to 20%) and those with addictive disorders the lowest. The literature on help seeking suggests that African Americans, people with low levels of educational attainment and people that are dangerous to themselves or others are all less likely to use mental health services.<sup>45</sup> Together these findings suggest that the people that experience decrements in productivity due to mental and addictive disorders are not disproportionately the people who get treatment.

#### Labor Market Impacts of Mental Illness and Substance Abuse Disorders: Developing Nations

While mental illness and substance abuse in industrialized nations have been well documented, the literature on the labor market impacts of these disorders in the developing world is extremely limited. Even so, it is believed that the burden of illness due to MH/SA disorders is high in many developing nations and that, consequently, the economic effects of these disorders may be considerable. The research that has been published to date focuses largely on prevalence data rather than on impacts, though some work has been done on job stress and its consequences for workers' mental health. However, there is much work to be done to better understand the impact of MH/SA disorders in developing nations and to elucidate differences between developing and industrialized areas. Below, we discuss evidence from studies conducted in Ethiopia, Nigeria and Indonesia.

Studies conducted by Kebede and Alem in Ethiopia have documented the prevalence and impact of schizophrenia, affective disorders and problem drinking in the urban center of Addis

Ababa and a rural province to the south of the city. While their work is restricted to Ethiopia, their methods may be useful for application to research in other developing countries. These methods include screening individuals in the community at large for MH/SA disorders, particularly outside of community clinics, as many areas have limited health services or rely primarily on traditional healing techniques. The authors also distinguish problem drinking from moderate alcohol consumption, which is common in many cultures, as alcohol is both legal and readily available in most areas, particularly because of local production.

In a study of alcohol dependence among men and women in Addis Ababa, Kebede and Alem reported a statistically significant 39% higher risk of problem drinking among employed individuals.<sup>46</sup> They also found a statistically significant negative association between increased educational level and problem drinking. In a separate survey of persons aged 15 and above in Butajira, a densely populated rural region of Ethiopia, Alem, Kebede and Kullgren found no association between educational level and problem drinking.<sup>47</sup> Employment levels were not included in this research. A third study that focused on schizophrenia in Butajira reported on the educational attainment, employment levels, and history of homelessness of subjects meeting the diagnostic criteria for schizophrenia.<sup>48</sup> Forty-five percent of cases had no formal education and an equal percentage was unemployed. More than 40% also came from the lowest economic third of society, though no causality is mentioned or implied for any of these characteristics.

Gureje and Bamidele conducted a 13-year follow up study of clinical outpatients with schizophrenia in Nigeria.<sup>49</sup> At follow-up, 48.3% of patients had experienced some sort of occupational disruption; 13% were completely incapacitated by their disease, while 25% had experienced disruptions to their work patterns that were deemed significant. In addition, patients

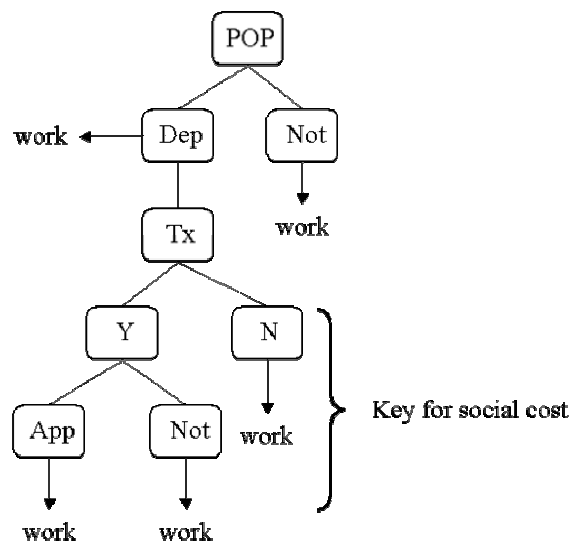
were more likely to be classified as belonging to a lower social class than their fathers, with 83% belonging to the lowest social class, compared with 55% of their fathers.

Bir and Frank have used data from a study of Indonesian men and women to document evidence of significant productivity losses due to mental illness.<sup>50</sup> Using the Indonesian Family Life Survey, Bir and Frank examined labor market outcomes in a sample representative of 83% of the Indonesian population. Among subjects with sadness plus two symptoms of mental illness, men worked 27% fewer hours per week and were about 52% as likely to be employed as individuals without symptoms. Both men and women with these symptoms were less likely to be working, though the lower rate of employment was more pronounced for males.

#### Treatment and Labor Market Outcomes

The linkages between the populations of people with a mental illness, treatment of that condition and labor market outcomes is complex and is summarized by Figure 1. Because the empirical evidence in this area is concentrated on the treatment of depression we use the treatment of depression as an example in the discussion that follows. The previous sections of this paper have focused on the node labeled as DEPRESSED and its link to work relative to the NOT depressed node and its associated work outcome. The next step in the potential course of illness and work concerns whether people with depression receive treatment. It is also important to understand the nature of the productivity losses suffered by the people who obtain treatment. Treatment is linked to outcome in part by whether people who are treated that are appropriately treated for depression.

Figure 1



A number of randomized trials in treating depression that were reported in the 1980s included measures of social functioning as part of their outcome assessments.<sup>51</sup> Most of these studies used the Social Adjustment Scale (SAS) that included information on “feelings of inadequacy, shame or not being able to handle things at work”, distress at work, and lack or loss of interest in the job. A meta analysis conducted on 10 randomized trials of treating depression concluded that “work outcomes were good when treatment was symptomatically effective...” The outcome measures unfortunately were not direct indicators of work activity or outcome. Several recent randomized effectiveness trials have included more direct measures of work performance and outcome such as work-days (absenteeism).

Several analyses of labor market outcomes from the Partners in Care (PIC) quality improvement program for treatment of depression focused on labor market outcomes. In the analysis by Wells and colleagues the focus was on employment rates for 12 months after initiation of the quality improvement intervention for experimental subjects relative to individuals in the control (Treatment as Usual [TAU]) condition.<sup>52</sup> In that study several key

findings were reported that allows one to fill in key relationships identified in Figure 1. Rates of appropriate treatment at baseline were between 43% and 44%. At the end of one year the rates of appropriate treatment were 59% for the experimental clinics and 50% for the control clinics. In the analysis of employment rates, Wells and colleagues found that for people who were employed at baseline, about 90% of the experimental subjects were employed one year later compared to 85% of those in the control group (a difference that was statistically significant at conventional levels). Among those people not employed at baseline between 17% and 18% of both intervention and control groups were working one year later.

In a second analysis of the PIC labor market outcomes, Schoenbaum and colleagues focused on absenteeism or days worked over a two-year period following initiation of the intervention.<sup>53</sup> The analysis of absenteeism finds gains in the number of days worked between intervention and control group study participants. The employment gains amounted to about 20 days over two years compared to the TAU control group. This difference was statistically significant at conventional levels. It is important to note that the TAU control population worked an average of 279 days over two years. Thus the intervention represents a 7% improvement in working days. To put these data into perspective employees that work 5 days a week for 48 weeks would work 480 days over two years.

In another research analysis from the Partners in Care study, Miranda, Schoenbaum and collaborators examine the link between quality improvement, appropriate treatment for depression and labor market outcomes.<sup>54</sup> They use structural equations methods to first model the connection between a quality improvement intervention and receipt of appropriate treatment and then to study the link between appropriate treatment and work outcomes. The results of the analysis shows that 1) minorities exposed to quality improvement programs are nearly twice as

likely to receive appropriate treatment than are otherwise similar minorities not exposed to such interventions; 2) whites exposed to quality improvement programs are 25% to 30% more likely to get appropriate care; 3) minorities receiving appropriate treatment are not significantly more likely to be employed 6 months after initiation of treatment than those not receiving appropriate treatment (68.2% vs. 56.5%); and 4) whites receiving appropriate treatment are also not significantly more likely to have improved work outcome 6 month after initiation of care (71.4% vs. 52.4%). The differences, while not significant at conventional levels, are sufficiently large to be suggestive of an impact.

Little research directly addresses the ability of treatment to restore productivity for people with depression. One study examined employment rates of people with histories of depression. That study compared people without any history of depression to people with a history of depression according to the time since they experienced their last episode. The study carefully controlled for demographic and human capital characteristics of individuals. The results indicate that employment probabilities of people without depression were equal to people with a history of depression if their last episode of depression had occurred at least eight years earlier.<sup>55</sup> The implication is that an episode of depression has an impact on labor force activity for some time after the actual episode of illness ends. Thus rapid return to full work place activity is not guaranteed.

Another clinical area where a substantial amount of research has been conducted on labor market outcomes is in the area of supported employment for people with severe mental disorders.<sup>56</sup> This area is important because supported employment has therapeutic effects and other benefits beyond just the act of working.<sup>57</sup> In recent years there have been several observational studies and a few randomized assessments of supported employment programs for

people with severe mental disorders. In general the studies show that supported employment programs have some success in increasing labor market participation however the much of the gain dissipates after a year. For example, some studies have reported success rates in placing people with severe mental disorders in competitive employment as high as 60% yet about 50% leave those jobs in 6 months.<sup>58</sup> The increases in earnings are modest (high end estimates of about \$130 per month) and are not generally sufficient to offset any substantial portion of the transfer payments made on behalf of people with severe mental disorders enrolled in the programs. In fact in some cases there is evidence that the additional income is due to improved ability to apply for and receive income support from public sources.<sup>59</sup> Moreover, there is scant evidence on any significant health and mental health care savings stemming from such employment initiatives.

#### Summary of Treatment Effects

The literature on treatment contains mixed results with respect to labor market outcomes. The literature on treatment of depression and schizophrenia demonstrates that real world programs can have an impact on work place outcomes. Thus treatments for mental and addictive disorders are effective and that translates into some work place functioning improvement. The less salutary results show that by and large the impacts of evidence-based treatment on outcomes relative to usual care or placebo are modest. Thus while there are work place benefits of mental health treatments they are likely to be small relative to the estimates of productivity losses from mental and addictive disorders. What are the reasons underlying this finding?

First, symptom improvements do not automatically translate into large gains in work place productivity. Even when significant gains do occur they do not appear to bring people to the productivity levels of similar people that have never been sick. Second, usual care is considerably less effective than the evidence based treatments that are typically studied in

clinical studies. For example, usual care (care as delivered in typical practice) results in appropriate treatment roughly 50% of the time compared to 70% of the time in evidence based treatment programs. These results apply primarily to depression. Much less is known regarding treatment of anxiety or addictive disorders that generate the largest levels of lost productivity. Third, the people who suffer the greatest productivity reductions are not typically the same people who seek out and receive treatment.

#### **IV. Conclusions and Recommendations**

Mental and addictive disorders are disruptive of labor market activities in industrialized economies. The evidence on this point is quite strong. Mental illnesses such as anxiety disorders, depression and schizophrenia affect the likelihood that someone can obtain and retain a job and the level of compensation obtained. Heavy drinking, alcohol dependence and chronic use of illicit drugs also reduce productive work activities among individuals affected by these disorders. Despite the difficult measurement issues that have plagued this literature there is now abundant evidence that serious substance abuse problems impose substantial burdens on the workplace.

The quality of evidence on labor market impacts of mental and addictive disorders for developing economies is considerably more limited. Despite the strong claims about the burden of mental and addictive disorders in developing extant evidence is quite limited. This observation is not meant to cast doubt on the likelihood that such burden occurs but rather to point out the limited understanding that exists regarding how these illnesses affect the labor market. This gap in understanding represents an important research opportunity.

In considering the likely effects - in more prevalent disorders like depression there is some evidence that people holding professional occupations may have stronger impacts on their work performance. This would tend to suggest somewhat weaker impacts in developing nations. The

impact on more manual types of work is high thereby suggesting a strong effect even in lower technology economics.

Our review of research on the labor market affects of mental and addictive disorders suggests that the efficiency case for expanded investment in treatment for mental and addictive disorders is less evident than has sometimes been claimed. While there have been estimates made suggesting very large productivity costs of illness there remain an important set of empirical linkages to be established to argue for the efficiency of expanded spending on care based on labor market information alone. In particular the links between treatment and restored productivity are key. The direct evidence in this area has largely focused on treatment for depression. Other disorders that generate larger estimated productivity losses have received considerably less attention with respect to the labor market impacts of treatment. The data on depression is illustrative of the complexity of arriving at judgments regarding the ultimate effect of expanding treatment on the level of lost productivity. In general the estimated treatment effects for evidence-based treatments that are implemented under controlled conditions are small to moderate. The evidence on usual care of depression is that for minority populations in the U.S. it produces smaller effects and more similar effects for the white population. The implication is that while treatment works and improves productivity it does not produce benefits anywhere near the level implied by lost productivity estimates.

The evidence on treatment for schizophrenia is less optimistic. While treatment programs and supported employment programs show success in improving work functioning, the evidence shows that the ability to recapture productivity losses for this enormously disabling illness is quite limited. The most effective supported employment programs can return a significant share of enrollees to some level of work activity. However, the success rates in job retention are quite

modest. Simulation studies based on symptoms and work activity also indicate relative limited success in job placement and retention. Usual care is likely considerably less effective in returning people with schizophrenia to work than are programs using the best practices. The evidence for the work place impacts of treating anxiety and substance abuse disorders, which are estimated to generate larger productivity costs than either depression or schizophrenia is still more limited. Research linking of treatment to work place impacts should be of the highest priority. Efficacy and effectiveness trials should regularly include labor market outcomes in the battery of measures administered.

Another key linkage concerns how the treatment system matches specific types of people with disorders to treatment. In most nations only a fraction of people suffering from mental and addictive disorders get treatment. Moreover, the population suffering from any particular mental or addictive disorder is quite heterogeneous in terms of the level of impairment or disability experienced as a result of illness. If treatment is to reduce the lost productivity stemming from mental disorders then it is important that the people that experience the largest productivity decrements are amenable to treatment and that the service delivery system will match them to the appropriate treatment. The evidence on treatment matching according to labor market impairment is limited and indirect in industrialized economies and largely non-existent for developing economies. The evidence indicates that the illnesses that generate the largest social losses are those with the lowest rates of treatment (anxiety and substance abuse disorders). Beyond that little is known with much confidence.

Great progress has been made in both treatment research and in the understanding of the social consequences of mental and addictive disorders. These illnesses are now viewed as important sources of impairment and disability. Moreover, the damage to basic human activities

and the economic well being of individuals and communities is now amply documented. There has been a rush to view the significant productivity losses coupled with gains in the effectiveness of treatment as being sufficient to establish the efficiency case for expanded funding of care mental and addictive disorders. Unfortunately our review suggests that that is a premature conclusion. We are confident that an efficiency case can be made but are less certain that labor market impacts on their own will be sufficient.

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<sup>1</sup> Tolley G, Kenkel D, Fabian R. *Valuing Health for Policy*. Chicago: University of Chicago Press, 1994.

<sup>2</sup> Surgeon General. *Mental Health: A Report of the Surgeon General*. Washington, DC: USGPO, 1999.

<sup>3</sup> Murray CJL, Lopez AD. *The Global Burden of Disease*. Cambridge: Harvard University Press, 1996.

<sup>4</sup> Surgeon General (1999) see note 2. Desjarlais R et al. *World Mental Health: Problems and Priorities in Low Income Countries*. New York: Oxford University Press, 1995.

<sup>5</sup> Rupp K and Stapleton DC. *Growth in Disability Benefits: Explanations and Policy Implications*. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 1998.

<sup>6</sup> Becker GS. *Human Capital*. New York: Columbia University Press, 1964. Grossman M. On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, 80: 223-255, 1972.

<sup>7</sup> Rice DP et al. *The Economic Costs of Alcohol and Drug Abuse and Mental Illness, 1985*. DHHS Publication No. (ADM) 90-1964, 1990

<sup>8</sup> Jin RL, Shah CP, Svoboda TJ. The Impact of Unemployment on Health: A Review of the Evidence. *Canadian Medical Journal*, 153(5), 1995. International Labour Office, *Mental Health in the Workplace*, Geneva: ILO, 2000.

<sup>9</sup> Ettner SL, Frank RG, Kessler RC. The Impact of Psychiatric Disorders on Labor Outcomes. *Industrial and Labor relations Review*, 51, 1997.

<sup>10</sup> See for examples Ettner, Frank and Kessler op cit and Hamilton VH, Merrigan P, Dufresne E. Down and Out: Estimating the Relationship Between Mental Health and Employment. *Health Economics*, 6(4): 397-406, 1997.

<sup>11</sup> Frank RG, Gertler P. An Assessment of measurement Error Bias for Estimating the Effect of Mental Distress on Income. *Journal of Human Resources*, 26(1), 1991.

<sup>12</sup> Examples of studies using this approach include: Ruhm CJ. The Effects of Physical and Mental Health on Female Labor Supply. In Frank R and Manning W, eds. *Economics and Mental Health*. Baltimore: Johns Hopkins Press, 1992. Mullahy J, Sindelar JL. "Alcoholism, Work and Income" *Journal of Labor Economics*, 11(3), 1993. Mitchell J, Anderson KH. Mental Health and Labor Force Participation of Older Workers. *Inquiry*, 26(2), 1989. Ettner SL, Frank RG, Kessler RC. The Impact of Psychiatric Disorders on Labor Outcomes. *Industrial and Labor relations Review*, 51, 1997.

<sup>13</sup> Mullahy J, Sindelar JL. Gender Differences in the Effects of Mental Health on Labor Force Participation. In: Sorkin I, Siragelden A, Frank R, eds. *Research in Human Capital and Development*. Greenwich CT: JAI Press, 1990.

<sup>14</sup> Currie J, Madrian BC. Health, Health Insurance and the Labor Market. In: Ashenfelter OC, Card D, eds. *Handbook of Labor Economics, Vol. 3C*. Amsterdam: Elsevier, 1999.

<sup>15</sup> Savoca E. Measurement Error in Self-evaluations of Mental Health: Implications for Labor Market Analysis. In: Frank R, Manning W, eds. *Economics and Mental Health*. Baltimore: Johns Hopkins Press, 1992.

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- <sup>16</sup> French MT, Zarkin GA, Dunlap LJ. Illicit Drug Use, Absenteeism, and Earnings at Six U.S. Worksites. *Contemporary Economics Policy*, 16(3): 334-346, 1998.
- <sup>17</sup> Claussen B. Alcohol Disorders and Re-employment in a 5-year Follow-up of Long-term Unemployed. *Addiction*, 94(1): 133-138, 1999.
- <sup>18</sup> Terza JV. Alcohol Abuse and Employment: A Second Look. *Journal of Applied Econometrics*, 17: 393-404, 2002.
- <sup>19</sup> Essock SM, Drake RE, Frank RG and McGuire TE. Randomized Controlled Trials in Evidence-Based Mental Health Care: Getting the Right Answer to the Right Question. *Schizophrenia Bulletin*, 29(1): 115-123, 2003.
- <sup>20</sup> See Miranda et al, for an exception. Miranda J, et al. The Effects of Primary Care Depression Treatment on Minority Patients' Clinical Status and Employment. *Archives of General Psychiatry*, in press, 2004.
- <sup>21</sup> Estimates are derived from: Rice DP. The Costs of Mental Illness, and unpublished update of Rice DP, et al. *The Economic Costs of Alcohol and Drug Abuse, and Mental Illness*, 1985. DHHS Publication No. (ADM) 90-1964, 1990; and Harwood H, et al. *The Economic Costs of Alcohol and Drug Abuse in the United States, 1992*, a report commissioned by the NIAAA and the NIDA, 1998.
- <sup>22</sup> Bartel A, Taubman P. Health and Labor Market Success: The Role of Various Diseases. *Review of Economics and Statistics*, 61(1), 1979. Bartel A, Taubman P, Some Economic and Demographic Consequences of Mental Illness. *Journal of Labor Economics*, 4(2), 1986.
- <sup>23</sup> Robins L, Regier DA. *Psychiatric Disorders in America: The Epidemiological Catchment Area Study*. New York: The Free Press, 1991.
- <sup>24</sup> Mitchell J, Anderson KH. Mental Health and Labor Force participation of Older Workers. *Inquiry*, 26(2), 1989.
- <sup>25</sup> Frank RG, Gertler P. An Assessment of measurement Error Bias for Estimating the Effect of Mental Distress on Income. *Journal of Human Resources*, 1991, 26(1).
- <sup>26</sup> Ruhm CJ. The Effects of Physical and Mental Health on Female Labor Supply. In: Frank RG, Manning WG, Jr., eds. *Economics and Mental Health*. Baltimore: Johns Hopkins Press, 1992.
- <sup>27</sup> Marcotte DE, Wilcox-Gök V, Redmon DP. The Labor Market Effects of Mental Illness: The Case of Affective Disorders. In: Salkever DS and A Sorkin, eds. *The Economics of Disability*. Greenwich CT.: JAI Press, 2000.
- <sup>28</sup> Kessler RC and Frank RG. The Impact of psychiatric Disorders on Work Loss Days. *Psychological Medicine*, 27(3), 1997.
- <sup>29</sup> Hamilton VH, Merrigan P, Dufresne E. Down and Out: Estimating the Relationship Between Mental Health and Unemployment. *Health Economics*, 6: 397-406, 1997.
- <sup>30</sup> Slade EP, Albers LA. Symptom Effects of Psychiatric Disorders on Labor Force Exits. In Salkever and Sorkin.
- <sup>31</sup> Alexandre PK, French MT. Labor Supply of Poor Residents in Metropolitan Miami, Florida: The Role of Depression and the Co-Morbid Effects of Substance Use. *Journal of Mental Health Policy and Economics*, 4: 161-173, 2001.
- <sup>32</sup> Slade EP, Salkever DS. Symptom Effects on Employment in a Structural Model of Mental Illness and Treatment: Analysis of Patients with Schizophrenia. *Journal of Mental Health Policy and Economics*, 4: 25-34, 2001
- <sup>33</sup> Mechanic D, Bilder S, McAlpine DD. Employing Persons with Mental Illness. *Health Affairs*, 21(5), 2002.
- <sup>34</sup> Zarkin GA, et al. Alcohol Use and Wages: New Results from the National Household Survey on Drug Abuse. *Journal of Health Economics*, 17: 53-68, 1998.
- <sup>35</sup> Buchmueller TC, Zuvekas SH. Drug Use, Drug Abuse, and Labour Market Outcomes. *Health Economics*, 7(3): 229-245 May 1998.
- <sup>36</sup> Claussen B. Alcohol Disorders and Re-employment in a 5-year Follow-up of Long-term Unemployed. *Addiction*, 94(1): 133-138, 1999.
- <sup>37</sup> Bray JW, et al. Symptoms of Dependence, Multiple Substance Use, and Labor Market Outcomes. *American Journal of Drug and Alcohol Abuse*, 26(1): 77-95, 2000.
- <sup>38</sup> MacDonald Z, and Pudney S. The Wages of Sin? Illegal Drug Use and the Labour Market. *Labour*, 14(4): 657-674, 2000.
- <sup>39</sup> French MT, Roebuck CM, Alexandre PK. Illicit Drug Use, Employment, and Labor Force Participation. *Southern Economic Journal*, 68(2): 349-368, 2001.
- <sup>40</sup> Kenkel DS and Wang P. Are Alcoholics in Bad Jobs? In Chaloupka FJ, et al., eds. *The Economic Analysis of Substance Use and Abuse*. Chicago: University of Chicago, 1999.
- <sup>41</sup> Jones, A.S. Wage and Non-Wage Compensation Among Young Alcoholic and Heavy Drinking Women: A Preliminary Analysis. *Journal of Family and Economic Issues*, 23(1): 3-25, 2002.
- <sup>42</sup> Barrett GF. The Effect of Alcohol Consumption on Earnings. *The Economic Record*, 78(1): 79-96, 2002.
- <sup>43</sup> See Terza JV, note 18.

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- <sup>44</sup> Kessler RC, Frank RG. The Impact of Psychiatric Disorders on Work Loss Days. *Psychological Medicine*, 27: 861-873, 1997.
- <sup>45</sup> McAlpine DD, Mechanic D. Utilization of Specialty Mental Health Care Among Persons with Severe Mental Illness: The Roles of Demographics, Need, Insurance and Risk. *Health Services Research*, 35(1): 277-292, 2000; and Cleary PD. Need and Demand for Mental Health Services. In: Taube C, Mechanic D, Hohmann A, eds. *The Future of Mental Health Services*. Washington: USGPO, 1989.
- <sup>46</sup> Kebede D, Alem A. The Epidemiology of Alcohol Dependence and Problem Drinking in Addis Ababa, Ethiopia. *Acta Psychiatrica Scandinavica*, 100: 30-34, 1999.
- <sup>47</sup> Alem A, Kebede D, Kullgren G. The Epidemiology of Problem Drinking in Butajira, Ethiopia. *Acta Psychiatrica Scandinavica*, 100: 77-83, 1999.
- <sup>48</sup> Kebede D, et al. Onset and Clinical Course of Schizophrenia in Butajira-Ethiopia. *Social Psychiatry and Psychiatric Epidemiology*, 38: 625-631, 2003.
- <sup>49</sup> Gureje, Bamidele. Thirteen-year Social Outcome Among Nigerian Outpatients with Schizophrenia. *Social Psychiatry and Psychiatric Epidemiology*, 34: 147-151, 1999.
- <sup>50</sup> Bir A, Frank R. Mental Illness and the Labour Market in Developing Nations. Paper prepared for WHO Commission on Macroeconomics and Health (CMH). Harvard University, 2001.
- <sup>51</sup> For a meta analysis of this body of research see: Mintz J, et al. Treatments of Depression and the Functional Capacity to Work. *Archives of General Psychiatry*, 49(10): 761-768, 1992.
- <sup>52</sup> Wells KB, et al. Impact of Disseminating Quality Improvement Programs for Depression in Managed Primary Care. *JAMA*, 283 (2): 212-220, 2000.
- <sup>53</sup> Schoenbaum M, et al. Cost-Effectiveness of Practice Initiated Quality Improvement for Depression. *JAMA*, 286(11): 1325-1330, 2001
- <sup>54</sup> Miranda J, et al. The Effects of Primary Care Treatment on Minority Patients' Clinical Status and Employment. Mental Health Services Research Center Working paper, 2003.
- <sup>55</sup> Marcotte DE, Wilcox-Gök V, Redmon P. Prevalence and Patterns of Major Depressive Disorder in the United States Labor Force. *Journal of Mental Health Policy and Economics* 2(3): 123-132, 1999.
- <sup>56</sup> Latimer E. Economic Impacts of Supported Employment for Persons With Severe Mental Illness. *Canadian J. of Psychiatry*, 46(8): 496-505, 2001.
- <sup>57</sup> Goldman HH. How do you pay your rent? Social policies and the President's Mental Health Commission. *Health Affairs*, 22(5): 65-72, 2003.
- <sup>58</sup> Bond GR. Implementing Supportive Employment as an Evidence Based Practice. *Psychiatric Services*, 52(3) 313-322, 2001; and Bond GR, et al. An Update on Supported Employment for People with Severe Mental Illness. *Psychiatric Services*, 48(3): 335-346, 1997.
- <sup>59</sup> Clark RE, Dain BJ, Xie H, et al. The Economic Benefits of Supported Employment for Persons with Mental Illness. *Journal of Mental Health Policy and Economics*, 1: 63-71, 1998.